KEITHLEY

MP MASTER
MA26492

System 40
Custom Coaxial RF Signal Routing Systems
Instruction Manual

Contains Operating and Servicing Information

KEITHLEY

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Manual Print History

The print history shown below lists the printing dates of all Revisions and Addenda created for this manual. The Revision Level letter increases alphabetically as the manual undergoes subsequent updates. Addenda, which are released between Revisions, contain important change information that the user should incorporate immediately into the manual. Addenda are numbered sequentially. When a new Revision is created, all Addenda associated with the previous Revision of the manual are incorporated into the new Revision of the manual. Each new Revision includes a revised copy of this print history page.

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Safety Precautions

The following safety precautions should be observed before using this product and any associated instrumentation. Although some instruments and accessories would normally be used with non-hazardous voltages, there are situations where hazardous conditions may be present.

This product is intended for use by qualified personnel who recognize shock hazards and are familiar with the safety precautions required to avoid possible injury. Read the operating information carefully before using the product.

The types of product users are:

Responsible body is the individual or group responsible for the use and maintenance of equipment, for ensuring that the equipment is operated within its specifications and operating limits, and for ensuring that operators are adequately trained.

Operators use the product for its intended function. They must be trained in electrical safety procedures and proper use of the instrument. They must be protected from electric shock and contact with hazardous live circuits.

Maintenance personnel perform routine procedures on the product to keep it operating, for example, setting the line voltage or replacing consumable materials. Maintenance procedures are described in the manual. The procedures explicitly state if the operator may perform them. Otherwise, they should be performed only by service personnel.

Service personnel are trained to work on live circuits, and perform safe installations and repairs of products. Only properly trained service personnel may perform installation and service procedures.

Exercise extreme caution when a shock hazard is present. Lethal voltage may be present on cable connector jacks or test fixtures. The American National Standards Institute (ANSI) states that a shock hazard exists when voltage levels greater than 30V RMS, 42.4V peak, or 60VDC are present. **A good safety practice is to expect that hazardous voltage is present in any unknown circuit before measuring.**

Users of this product must be protected from electric shock at all times. The responsible body must ensure that users are prevented access and/or insulated from every connection point. In some cases, connections must be exposed to potential human contact. Product users in these circumstances must be trained to protect themselves from the risk of electric shock. If the circuit is capable of operating at or above 1000 volts, **no conductive part of the circuit may be exposed.**

As described in the International Electrotechnical Commission (IEC) Standard IEC 664, digital multimeter measuring circuits (e.g., Keithley Models 175A, 199, 2000, 2001, 2002, and 2010) are Installation Category II. All other instruments' signal terminals are Installation Category I and must not be connected to mains.

Do not connect switching cards directly to unlimited power circuits. They are intended to be used with impedance limited sources. NEVER connect switching cards directly to AC mains. When connecting sources to switching cards, install protective devices to limit fault current and voltage to the card.

Before operating an instrument, make sure the line cord is connected to a properly grounded power receptacle. Inspect the connecting cables, test leads, and jumpers for possible wear, cracks, or breaks before each use.

For maximum safety, do not touch the product, test cables, or any other instruments while power is applied to the circuit under test. ALWAYS remove power from the entire test system and discharge any capacitors before: connecting or disconnecting cables or jumpers, installing or removing switching cards, or making internal changes, such as installing or removing jumpers.

Do not touch any object that could provide a current path to the common side of the circuit under test or power line (earth) ground. Always make measurements with dry hands while standing on a dry, insulated surface capable of withstanding the voltage being measured.

The instrument and accessories must be used in accordance with its specifications and operating instructions or the safety of the equipment may be impaired.

Do not exceed the maximum signal levels of the instruments and accessories, as defined in the specifications and operating information, and as shown on the instrument or test fixture panels, or switching card.

When fuses are used in a product, replace with same type and rating for continued protection against fire hazard.

Chassis connections must only be used as shield connections for measuring circuits, NOT as safety earth ground connections.

If you are using a test fixture, keep the lid closed while power is applied to the device under test. Safe operation requires the use of a lid interlock.

If a screw is present, connect it to safety earth ground using the wire recommended in the user documentation.

The symbol on an instrument indicates that the user should refer to the operating instructions located in the manual.

The symbol on an instrument shows that it can source or measure 1000 volts or more, including the combined effect of normal and common mode voltages. Use standard safety precautions to avoid personal contact with these voltages.

The **WARNING** heading in a manual explains dangers that might result in personal injury or death. Always read the associated information very carefully before performing the indicated procedure.

The **CAUTION** heading in a manual explains hazards that could damage the instrument. Such damage may invalidate the warranty.

Instrumentation and accessories shall not be connected to humans.

Before performing any maintenance, disconnect the line cord and all test cables.

To maintain protection from electric shock and fire, replacement components in mains circuits, including the power transformer, test leads, and input jacks, must be purchased from Keithley Instruments. Standard fuses, with applicable national safety approvals, may be used if the rating and type are the same. Other components that are not safety related may be purchased from other suppliers as long as they are equivalent to the original component. (Note that selected parts should be purchased only through Keithley Instruments to maintain accuracy and functionality of the product.) If you are unsure about the applicability of a replacement component, call a Keithley Instruments office for information.

To clean an instrument, use a damp cloth or mild, water based cleaner. Clean the exterior of the instrument only. Do not apply cleaner directly to the instrument or allow liquids to enter or spill on the instrument. Products that consist of a circuit board with no case or chassis (e.g., data acquisition board for installation into a computer) should never require cleaning if handled according to instructions. If the board becomes contaminated and operation is affected, the board should be returned to the factory for proper cleaning/servicing.

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Installation

Introduction

System 40 Custom Coaxial RF Signal Routing Systems provide an integrated signal routing solution designed and built to customer specifications. The System 40 typically includes a Keithley Model 7001 or 7002 switch control unit, microwave coaxial switches, a power supply, and a 19-inch rack mount assembly. The IEEE-488 compatible switch controller operates the coaxial switches and provides an easy to read display of switch status. Switch control algorithms are pre-programmed and stored in the switch control unit's non-volatile memory at the factory. If desired, the switch system can be reconfigured by reprogramming the controller for new applications.

Due to the custom nature of the System 40, this Instruction Manual contains general system instructions. Specific information for your system is provided in the as-built documentation package.

System 40 documentation consists of:

- System 40 Custom Coaxial RF Signal Routing Systems Instruction Manual
- Model 7001 or 7002 Switch System Manual
- Additional Keithley standard product manuals per system configuration
- As-built documentation package including:
  — Component list
  — Wiring list
  — Programming list

Warranty

Warranty information is located at the front of this manual. Note that coaxial switches are warranted for a period of one year or their specified lifetime.

System 40 installation guidelines

WARNING **The information on the following pages is intended for qualified service personnel only. Do not attempt these procedures unless you are qualified to do so.**

CAUTION **To prevent flexing of the connections and possible damage, ensure that the Model 7020-MWS card is secured with its thumbscrew to the Model 7001/2 rear panel, and that the cable assembly is secured with its two screws to the 7020-MWS card.**

Fixed rack installation

System 40 systems are either shelf mounted or mounted directly in a rack.

Rack mount

Table 1-1
System 40 rack assembly parts

Quantity	Description	Keithley part number	Function
2	Bracket, rear support	BR-21	Attaches chassis rear to rear rack rails.
4 4	10-32 Kepnut 10-32 × ⅜ Phillips pan head screw	10-32 KEPNUT 10-32x3/8 PPH	Attaches rear support brackets to chassis.
8 8	Fastener, captive nut 10-32 × ⅝ Phillips pan head screw	FA-148 10-32x5/8 PPH	Attaches rear support brackets and front panel to rails.
1	10-32 × ⅜ Phillips pan head sems screw	10-32x3/8 PPHSEM	Connect ground cable to earth ground.

Parts list

Table 1-1 lists the supplied parts required to rack mount a typical System 40 chassis.

Rack preparation

1. Select a location in the rack.
2. Hold up the system at the selected location in the rack. The four slotted mounting holes in the front panel dictate the location of the captive nut fasteners on the front rack rails. Mark where the fasteners are to be installed.
3. Referring to Figure 1-1, install four fasteners so the captive nuts are located behind the appropriate holes on the front rack rails.

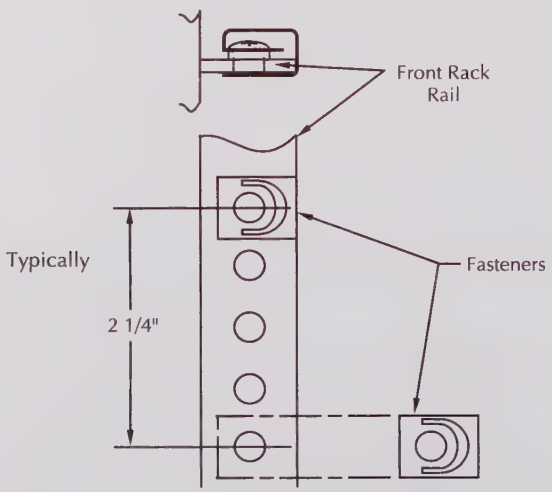

Figure 1-1
Fastener installation

System installation

Refer to Figure 1-2 to install the chassis and support brackets in the rack.

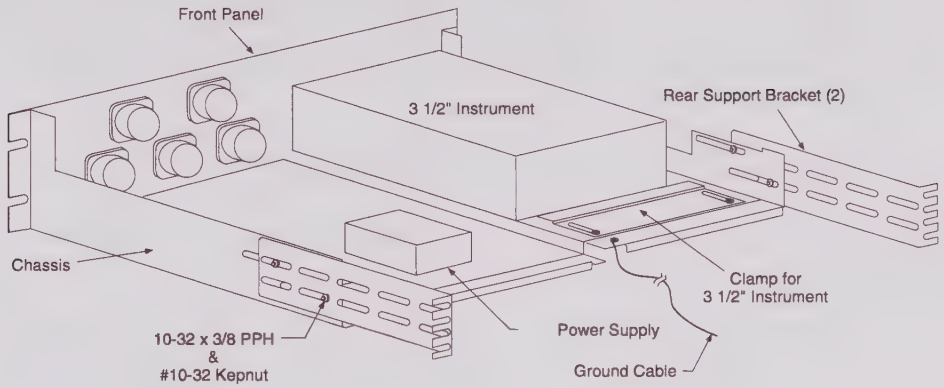

Figure 1-2
Mounting kit installation

1. Loosely attach the rear support brackets to the chassis with kepnuts and 10-32 × ⅜ screws.
2. Position the chassis assembly in the rack to adjust the support brackets, and note the location for the captive nut fasteners on the rear rack rails.
3. Install four fasteners so the captive nuts are located behind the appropriate holes on the rear rack rails.
4. Loosely attach the chassis assembly to the front and rear rack rails with 10-32 × ⅝ screws. Secure the rear support brackets to the chassis.
5. Tighten all screws.

WARNING **The System 40 must be separately connected to a safety earth ground to maintain protection against possible shock hazard. Failure to connect the unit to a safety earth ground may result in personal injury or death due to an electric shock.**

Shelf mount

Rack preparation

1. Select a position in the rack. In most cases, the weight of the System 40 dictates a position in the lower half of the rack. The System 40 typically takes up 10.5" of vertical space.

NOTE *The chassis must be mounted at a height that is an increment of 1¾" from the top or bottom of the rack. Attempting to mount the mainframe at a non-incremental height will lead to difficulties with hole alignment.*

2. Install chassis support assemblies in the rack and secure them.
3. Lift the System 40 onto the chassis supports and slide it into the rack.
4. The chassis can be secured to the front rack flanges with binder head screws.

System earth ground installation

1. Remove all power from the system.
2. Connect the loose end of the six foot green/yellow ground cable to a quality ground located within your facility using the #10 screw provided.

Power and control connections

Line power, switch control signals and computer control signals must be connected prior to system operation. RF switch control signals are connected from the 7020-MWS\QCC switch card, installed in the 7001/2 mainframe, to the System 40 chassis mounted RF switch terminals using a ribbon cable terminated with a 96-pin DIN connector. One piece System 40's may be shipped from the factory with this cable connected, two piece systems must be connected after rack installation. The ribbon cable 96-pin DIN connector label identifies the mating 7020-MWS connector. Secure the connectors by tightening the two captive mounting screws located on the ribbon cable connector.

WARNING **Before beginning any wiring procedures, make sure all power is off.**

CAUTION **96-pin DIN connectors must be securely fastened to the 7020-MWS card or damage to the card may occur.**

5. Connect Model 7001 or 7002 line power and IEEE-488 interface cable as described in the Switch System Manual.
6. Connect the RF switch power supply line cord to the same AC power source circuit as the switch mainframe.

Coaxial cable installation

System 40 is configured with RF and microwave connectors suitable for the specified operating frequency range. Mating connectors must be clean, must meet connector type interface specifications, and must be tightened to the appropriate torque specification.

WARNING **Contact with exposed conductors carrying RF power may cause burns. Place protective caps on all unused switch inputs. All cables and connectors should be properly mated and shielded.**

CAUTION **Mating connectors with out of tolerance pin depths may destroy the connector. Verify pin depth before mating connectors.**

Coaxial connector cleaning

Connector interfaces must be free of foreign material to prevent performance degradation. Visually inspect the connector using a 4X to 10X magnifying lens. Try to blow foreign material off the connector using canned air. (Canned air is recommended due to the presence of moisture and oils in air supplied by standard industrial compressors.) Use a lint free miniature cleaning swab moistened with clean isopropyl alcohol to wipe off any remaining foreign material.

Coaxial connector mating

1. Remove all power to the system before installing cables.

2. Connect cables to System 40 connectors and tighten using a 5/16 inch torque wrench, to 7-10 in.-lb for SMA type connectors. Type-N connectors may be connected finger tight. Refer to as-built documentation for other connector types.

CAUTION **Application of excessive torque may damage connector.**

2

Operation

Introduction

System 40 Custom Microwave Switch Systems are derived from the Keithley Model 7116-MWS. Because each System 40 is unique, the 7116-MWS will be used to represent a typical configuration for switch system operating principles and troubleshooting procedures.

The Model 7116-MWS system is a 16-input microwave multiplexer. Sixteen inputs are achieved by connecting five single-pole, four-throw switches together forming a tree switching network as shown in Figure 2-1.

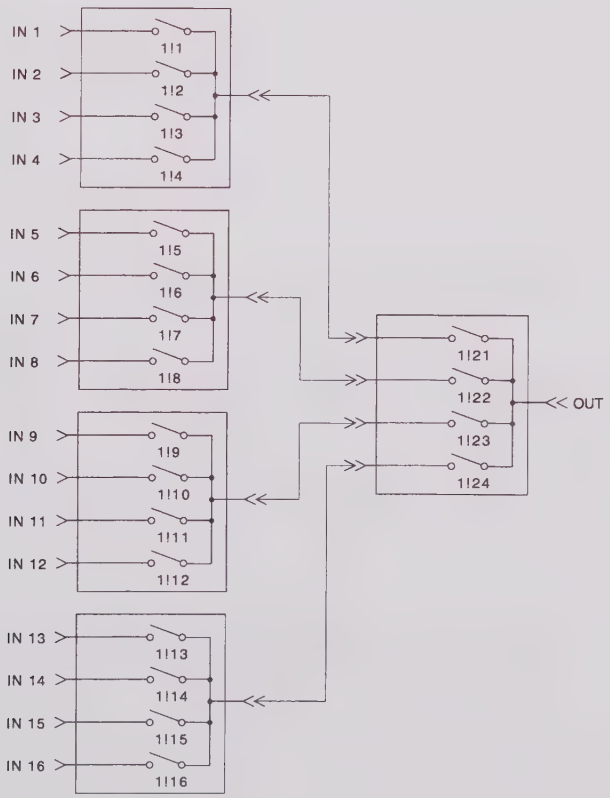

Figure 2-1
Tree switching network

Operating instructions

To select an input channel, the Model 7001 must close two switches at the same time. Table 2-1 lists which Model 7020-MWS digital outputs must be activated to select each respective RF input. The table also shows 7001 channels used to select the inputs.

Table 2-1
Model 7001 channels and memory locations for 1x16 multiplexer

7116-MWS Input	7020-MWS Digital Outputs				7001 Channels	7001 Memory Location	7116-MWS Relays
	Bank A	Bank B	Bank C	Bank D			
Ch. 1	OUT 1		OUT 21		1!1,1!21	M1	
Ch. 2	OUT 2		OUT 21		1!2,1!21	M2	K1, K5
Ch. 3	OUT 3		OUT 21		1!3,1!21	M3	
Ch. 4	OUT 4		OUT 21		1!4,1!21	M4	
Ch. 5	OUT 5		OUT 22		1!5,1!22	M5	
Ch. 6	OUT 6		OUT 22		1!6,1!22	M6	K2, K5
Ch. 7	OUT 7		OUT 22		1!7,1!22	M7	
Ch. 8	OUT 8		OUT 22		1!8,1!22	M8	
Ch. 9		OUT 9	OUT 23		1!9,1!23	M9	
Ch. 10		OUT 10	OUT 23		1!10,1!23	M10	K3, K5
Ch. 11		OUT 11	OUT 23		1!11,1!23	M11	
Ch. 12		OUT 12	OUT 23		1!12,1!23	M12	
Ch. 13		OUT 13	OUT 24		1!13,1!24	M13	
Ch. 14		OUT 14	OUT 24		1!14,1!24	M14	K4, K5
Ch. 15		OUT 15	OUT 24		1!15,1!24	M15	
Ch. 16		OUT 16	OUT 24		1!16,1!24	M16	

Output patterns for each input are stored in the Model 7001 memory at the factory. The user can call up memory locations to select each input. For example, calling up memory location 1 selects input 1. Some programming examples are listed below.

```
PRINT #1,"output 7; :close (@ 1!1,1!21)"        'Channels select input 1
PRINT #1,"output 7; :close (@ M1)"              'Memory location 1 selects input 1
```

NOTE *Information stored in non-volatile memory will be lost if power is applied to the switch mainframe when switch cards, such as the 7020-MWS, have been removed. To assure memory remains as factory programmed, never power up the mainframe with a switch card removed.*

In either configuration of the Model 7116-MWS, as one 1 ×16 multiplexer or, with the semi-rigid jumper cables removed, as five 1 ×4 multiplexers, ensure that only one channel is closed per relay, and that no more than two relays are energized simultaneously per bank.

For further information on operation and programming, refer to the Models 7001 and 7020 Instruction Manuals.

Power limits

The Model 7020-MWS\QCC card is a modified version of the Model 7020 Digital I/O Interface Card. Among other changes, the output protection network has been removed for greater sink current capacity.

CAUTION **This card is not intended for use in applications other than the Model 7116-MWS \QCC system. The 7020-MWS\QCC and 7020 cards are not interchangeable. Damage or unintended operation may result if a Model 7020 is substituted for a 7020-MWS\QCC.**

NOTE *A bank refers to the internal IC that is used to drive eight output channels. The card uses five driver ICs (banks) to accomodate the 40 output channels. The outputs are grouped as follows for each bank:*

Bank A = OUT 1 through OUT 8
Bank B = OUT 9 through OUT 16
Bank C = OUT 17 through OUT 24
Bank D = OUT 25 through OUT 32
Bank E = OUT 33 through OUT 40

Switch life

The life of a switch is usually specified in cycles, that is the number of times it switches from one position to another and back. System 40 RF switches have lives from one-million to ten-million (1,000,000 to 10,000,000) cycles per switch position without noticeable performance degradation.

NOTE *Cold switching (no RF power applied), hot switching (RF power applied) may rapidly degrade switch performance.*

That is:

- No intermittent contacts
- Less than 0.1 dB increase in insertion loss
- Less than 0.3 ohm increase in DC contact resistance

Model 7020-MWS configuration

The Model 7020-MWS card is a modified version of the Model 7020 card. The output protection network (R-40 to R-440 and RT-401 to RT-440) has been replaced with jumpers for greater sink current capacity. The Model 7020 specifications changed as follows:

Maximum Sink Current: Per Channel: 250 mA
Per Bank (8 bits): 1A
Per Card: 2.5A

CAUTION **Exceeding the output sink current specifications may cause damage to the Model 7020-MWS card. This card is not intended for use in applications other than the System 40.**

Model 7020-MWS 96-pin DIN connector pinout

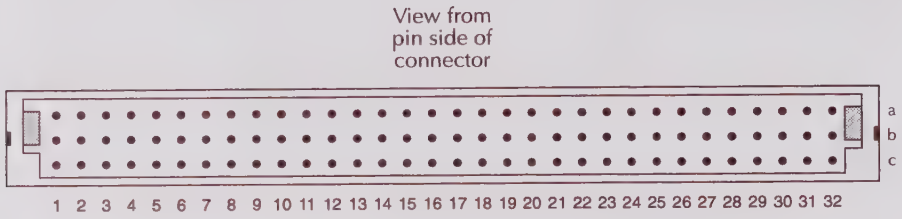

Figure 2-2
96-pin DIN connector pinout

Table 2-2
Output channel terminal identification

Output channel	Bank	Connector pin no.	Output channel	Bank	Connector pin no.
OUT1	A	2a	OUT21	C	10b
OUT2	A	4a	OUT22	C	12b
OUT3	A	6a	OUT23	C	14b
OUT4	A	8a	OUT24	C	16b
OUT5	A	10a	OUT25	D	18b
OUT6	A	12a	OUT26	D	20b
OUT7	A	14a	OUT27	D	22b
OUT8	A	16a	OUT28	D	24b
OUT9	B	18a	OUT29	D	26b
OUT10	B	20a	OUT30	D	28b
OUT11	B	22a	OUT31	D	30b
OUT12	B	24a	OUT32	D	32b
OUT13	B	26a	OUT33	E	2c
OUT14	B	28a	OUT34	E	4c
OUT15	B	30a	OUT35	E	6c
OUT16	B	32a	OUT36	E	8c
OUT17	C	2b	OUT37	E	10c
OUT18	C	4b	OUT38	E	12c
OUT19	C	6b	OUT39	E	14c
OUT20	C	8b	OUT40	E	16c

Table 2-3
Input channel terminal identification

Input channel	Bank	Connector pin no.	Input channel	Bank	Connector pin no.
IN1	A	1a	IN21	C	9b
IN2	A	3a	IN22	C	11b
IN3	A	5a	IN23	C	13b
IN4	A	7a	IN24	C	15b
IN5	A	9a	IN25	D	17b
IN6	A	11a	IN26	D	19b
IN7	A	13a	IN27	D	21b
IN8	A	15a	IN28	D	23b
IN9	B	17a	IN29	D	25b
IN10	B	19a	IN30	D	27b
IN11	B	21a	IN31	D	29b
IN12	B	23a	IN32	D	31b
IN13	B	25a	IN33	E	1c
IN14	B	27a	IN34	E	3c
IN15	B	29a	IN35	E	5c
IN16	B	31a	IN36	E	7c
IN17	C	1b	IN37	E	9c
IN18	C	3b	IN38	E	11c
IN19	C	5b	IN39	E	13c
IN20	C	7b	IN40	E	15c

Table 2-4
Miscellaneous terminal identification

Terminal	Connector pin no.
GND	17c
5.3V	18c
5.3V	19c
GND	20c
VEXT1	21c
VEXT1	22c
GND	23c
GND	24c
VEXT2	25c
VEXT2	26c
NC	27c
NC	28c
NC	29c
NC	30c
NC	31c
NC	32c

Model 7020-QCC 96-pin DIN connector pinout

Table 2-5
Output channel terminal identification

Output channel	Bank	Connector pin no.	Output channel	Bank	Connector pin no.
OUT1	A	01a	OUT21	C	07b
OUT2	A	02a	OUT22	C	08b
OUT3	A	03a	OUT23	C	09b
OUT4	A	04a	OUT24	C	10b
OUT5	A	05a	OUT25	D	11b
OUT6	A	06a	OUT26	D	12b
OUT7	A	07a	OUT27	D	13b
OUT8	A	08a	OUT28	D	01c
OUT9	B	09a	OUT29	D	02c
OUT10	B	10a	OUT30	D	03c
OUT11	B	11a	OUT31	D	04c
OUT12	B	12a	OUT32	D	05c
OUT13	B	13a	OUT33	E	06c
OUT14	B	14a	OUT34	E	07c
OUT15	B	01b	OUT35	E	08c
OUT16	B	02b	OUT36	E	09c
OUT17	C	03b	OUT37	E	10c
OUT18	C	04b	OUT38	E	11c
OUT19	C	05b	OUT39	E	12c
OUT20	C	06b	OUT40	E	13c

Table 2-6
Input channel terminal identification

Input channel	Bank	Connector pin no.	Input channel	Bank	Connector pin no.
IN1	A	19a	IN21	C	26b
IN2	A	20a	IN22	C	27b
IN3	A	21a	IN23	C	28b
IN4	A	22a	IN24	C	29b
IN5	A	23a	IN25	D	30b
IN6	A	24a	IN26	D	31b
IN7	A	25a	IN27	D	32b
IN8	A	26a	IN28	D	20c
IN9	B	27a	IN29	D	21c
IN10	B	28a	IN30	D	22c
IN11	B	29a	IN31	D	23c
IN12	B	30a	IN32	D	24c
IN13	B	31a	IN33	E	25c
IN14	B	32a	IN34	E	26c
IN15	B	20b	IN35	E	27c
IN16	B	21b	IN36	E	28c
IN17	C	22b	IN37	E	29c
IN18	C	23b	IN38	E	30c
IN19	C	24b	IN39	E	31c
IN20	C	25b	IN40	E	32c

Table 2-7
Miscellaneous terminal identification

Terminal	Connector pin no.
VEXT1	15a
VEXT1	16a
NC	17a
+5.3V	14b
GND	15b
VEXT2	16b
N/C	17b
GND	18b
N/C	19b
GND	14c
VEXT2	15c
+5.3V	16c
N/C	17c
N/C	18c
GND	19c

3

Service

Introduction

The Keithley Model 7116-MWS is the standard product that the System 40 is derived from. An explanation of its troubleshooting procedure is presented here to demonstrate switch system troubleshooting.

NOTE *Typically System 40 RF switch power supplies are set for 29 volts (28 volts supplied to RF switch coil through 7020-MWS). Refer to as-built documentation for the voltage used in your system.*

The following paragraphs contain troubleshooting and replacement parts information. Schematic diagrams and component layout drawings for the System 40 chassis are in the as-built documentation package. Refer to Model 7001 and 7020 manuals for further information about these components.

Troubleshooting

WARNING

The information in this section is intended for qualified service personnel only. Some of the procedures may expose you to hazardous voltages that could result in personal injury or death. Do not attempt to perform these procedures unless you are qualified to do so.

Troubleshooting equipment

The Model 2000 Digital Multimeter is recommended for troubleshooting.

Troubleshooting procedure

Table 3-1 summarizes the procedure for verifying operation of the Model 7116-MWS. Refer to the system schematic and the chassis wiring diagram for component locations.

Table 3-1
Troubleshooting procedure

Step	Item/component	Required condition	Comment
1	Chassis		All voltages referenced to chassis
2	K1-K5, pin COM	< 29VDC	Relay coil voltage
3	K1 pin 1, K5 pin 1	< 1.5V	Close channel 1
4	K1 pin 2, K5 pin 1	< 1.5V	Close channel 2
5	K1 pin 3, K5 pin 1	< 1.5V	Close channel 3
6	K1 pin 4, K5 pin 1	< 1.5V	Close channel 4
7	K2 pin 1, K5 pin 2	< 1.5V	Close channel 5
8	K2 pin 2, K5 pin 2	< 1.5V	Close channel 6
9	K2 pin 3, K5 pin 2	< 1.5V	Close channel 7
10	K2 pin 4, K5 pin 2	< 1.5V	Close channel 8
11	K3 pin 1, K5 pin 3	< 1.5V	Close channel 9
12	K3 pin 2, K5 pin 3	< 1.5V	Close channel 10
13	K3 pin 3, K5 pin 3	< 1.5V	Close channel 11
14	K3 pin 4, K5 pin 3	< 1.5V	Close channel 12
15	K4 pin 1, K5 pin 4	< 1.5V	Close channel 13
16	K4 pin 2, K5 pin 4	< 1.5V	Close channel 14
17	K4 pin 3, K5 pin 4	< 1.5V	Close channel 15
18	K4 pin 4, K5 pin 4	< 1.5V	Close channel 16

NOTE: See Table 2-1 for information on closing channels.

Ordering information

To place an order or to obtain information concerning replacement parts, contact your Keithley representative or the factory. When ordering parts, be sure to include the following information:

- Model numbers 7020-MWS, and 7001/2, System 40
- Serial number of the chassis, card, or mainframe, workorder number on System 40 chassis
- Part description
- Circuit designation (if applicable)
- Keithley part number

Factory service

If the System 40 system must be returned to Keithley for repair, perform the following:

1. Call the Repair department at 1-800-552-1115 for a Return Material Authorization (RMA) number.
2. Complete the service form at the back of this manual and include it with the card.
3. Carefully pack the card in the original packing carton.
4. Write ATTENTION REPAIR DEPT and the RMA number on the shipping label.

KEITHLEY

Service Form

Model No. _____ **Serial No.** _____ **Date** _____

Name and Telephone No. _____

Company _____

List all control settings, describe problem and check boxes that apply to problem. _____

_____

_____

- ❑ Intermittent
- ❑ IEEE failure
- ❑ Front panel operational
- ❑ Analog output follows display
- ❑ Obvious problem on power-up
- ❑ All ranges or functions are bad
- ❑ Particular range or function bad; specify _____
- ❑ Batteries and fuses are OK
- ❑ Checked all cables

Display or output (check one)

- ❑ Drifts
- ❑ Unstable
- ❑ Overload
- ❑ Unable to zero
- ❑ Will not read applied input

- ❑ Calibration only
- ❑ Data required
- ❑ Certificate of calibration required

(attach any additional sheets as necessary)

Show a block diagram of your measurement system including all instruments connected (whether power is turned on or not). Also, describe signal source.

Where is the measurement being performed? (factory, controlled laboratory, out-of-doors, etc.)

_____

_____

What power line voltage is used? _____ Ambient temperature? _____ °F

Relative humidity? _____ Other? _____

Any additional information. (If special modifications have been made by the user, please describe.)

_____

_____

Be sure to include your name and phone number on this service form.

KEITHLEY

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